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NEW GENERA, SPECIES AND A NEW SUBFAMILY OF XYALIDAE (NEMATODA: MONHYSTERIDA) FROM OCEAN BEACHES IN AUSTRALIA AND THAILAND

by WARWICK L. NICHOLAS* & AIMORN C. STEWART*

Summary

NICHOLAS, W. L. & STEWART, A. C. (1995) New genera, species and a new subfamily of Xyalidae (Nematoda: Monhysterida) from ocean beaches in Australia and Thailand. *Trans. R. Soc. S. Aust.* 119(2), 47-66, 31 May, 1995.

Five new species of Xyalidae are described from Australian ocean beaches and one from Thailand. *Gullanema fragilis* gen. nov., sp. nov., possesses many long cervical and somatic setae, but is distinguishable from other similarly hirsute Cobbiinae by a distinctive narrow peri-buccal region. *Rhynchonema tomakinese* sp. nov., *R. collare*, sp. nov. and *Prorhynchonema gourbaultae* sp. nov., in the Rhynchonematinae, differ from congeneric species by their spicules and amphidial regions. *R. chiloense* Lorenzen, 1975 and *R. gerlachi* Vitiello, 1967, and *P. warwicki*, Gourbault, 1982 are commented upon. Two new species with characters intermediate between the Cobbiinae and Rhynchonematinae are placed in a new subfamily, the Corononeminae. The cervical region, enclosing a cylindrical buccal cavity, is shorter and less attenuated than in Rhynchonematinae, longer and narrower than Cobbiinae. The labial region is set off from the buccal region by a narrow indented ring. *Coronoñema parvum*, gen nov., sp. nov., is described from Australia and *C. thai* sp. nov., from Thailand, the two differing in the shape of the head.

KEY WORDS: Taxonomy, nematodes, Xyalidae, beaches, *Gullanema*, gen. nov., *Rhynchonema*, *Prorhynchonema*, *Coronoñema*, gen. nov.

Introduction

Nematodes have been collected from sandy beaches on the southern, eastern and northern coasts of Australia and southern Thailand. Previously we (Stewart and Nicholas 1994), described eight new species of Xyalidae Chitwood, 1951 belonging to well-known genera of Cobbiinae de Coninck, 1965. In this paper we describe a new species and genus of Cobbiinae, namely *Gullanema fragilis* gen. nov., sp. nov., and three new species from the other subfamily of Xyalidae, the Rhynchonematinae de Coninck, 1965, namely *Rhynchonema tomakinense*, sp. nov., *R. collare*, sp. nov. and *Prorhynchonema gourbaultae* sp. nov. Species of *Rhynchonema* Cobb, 1920 are common in Australian sandy beaches, as in other parts of the world, and we comment on Australian specimens belonging to two previously described species. The genus was comprehensively reviewed by Lorenzen (1975). We also erect a new subfamily, Corononeminae, to hold *Coronoñema parvum* gen. nov., sp. nov. and *C. thai* sp. nov., with characters intermediate between Cobbiinae and Rhynchonematinae. The last named species is from Thailand.

* Division of Botany and Zoology, Australian National University, 0200 Canberra, Australia.

Materials and Methods

Collections were made on the 90 Mile Beach at Seaspray, Victoria (147° 23'E, 38° 46'S); South Moruya, Broulee, Rosedale, Tomakin and Kioloa beaches, New South Wales (between 150° 9'E, 35° 55'S and 150° 20'E, 35° 32'S); Southport beach, Queensland (153° 25'E, 27° 58'S) and Rapid Creek beach, a suburb of Darwin, Northern Territory (130° 50'E, 12° 23'S). Some specimens were also collected from Pathaya beach, Chonburii, Thailand (100° 53'E, 12° 45'N). Specimens were collected in samples of sand dug up at low tide between the tidemarks to a depth of 40 cm. Exceptions were samples of sub-littoral sand taken from a boat in shallow water off Cronulla, New South Wales (151° 10'E; 34° 05'S).

Nematodes were extracted from the sand by re-suspension in tap water, allowing the sand to settle and collecting the nematodes on a 50 μm nylon mesh sieve. The nematodes were washed off the sieve into sea water, then fixed in 5% formalin in sea water.

Specimens were picked up under the microscope with a fine pipette and transferred to 5% aqueous glycerol which was slowly dehydrated to anhydrous glycerol at 40°C. Permanent mounts were made in anhydrous glycerol, and the cover slips ringed with Glyceel (Gurr). Glass beads (ballatini), selected under the microscope to approximate the diameter of the nematodes, were used to support the cover slips.

Drawings and measurements were made using a camera lucida. When mounted the nematodes lie on their sides presenting a lateral view (except in Fig. 19). Our drawings show setae on one side only, that lying uppermost as mounted.

Measurements are in μm from specimens fixed and mounted in this way. De Man's ratios are given, i.e. a = body length divided by greatest body width, b = length divided by length of pharynx, c = length divided by tail length, c' = tail length divided by width at anus, V = anterior end to vulva as a percentage of body length, and spicule measurements are arc length. For Rhynchonematinae, Lorenzen's (1975) formula has been used to summarise the characteristic features of each species described. In this formula a letter code, referring to drawings of characteristic structural features, is used to describe successively the form of body annulation, symmetry of the spicules, form of the spicules, annulation surrounding the amphids, relative size of amphids in both sexes, position of amphids relative to end of buccal tube, form of buccal cavity, and form of the vulva. An important character is the direction, either towards the anterior or towards the posterior, of the saw-tooth edge of cuticular annulation (*reifenartig dick mit sägeartiger Aussenkontur*). In some species there is an abrupt mid-body change in direction. Where this is so, the distance from the head end to the inversion is expressed as a percentage of body length. In other species only the cervical and tail regions have saw-tooth annulation, the mid region of the body having rounded annule profiles.

Scanning electron micrographs (SEM) were made from specimens that had been post-fixed in 1% aqueous osmium tetroxide, freeze-dried and coated with gold palladium. Type material is deposited in the South Australian Museum, Adelaide, and the museum's numbers are given in the text. Holotype numbers (all males) follow SAMA and the prefix V. Some paratypes are on the same slide, to give both a male and a female. Other paratypes are on slides labelled AHC followed by a number.

Taxonomic descriptions

Family Xyalidae Chitwood, 1951.

Annulated cuticle, circular cryptospiral amphids, female with single prodelphic ovary situated to left of gut, male with one or two testes, anterior situated to left of gut, posterior if present to right of gut.

Subfamily Cobbiinae de Coninck, 1965

With characters of family. Head and cervical region only slightly attenuated, base of buccal cavity conical, enclosed by pharyngeal musculature, 10 sensilla in second ring of cephalic sensilla, usually segmented.

Genus *Gullanema* gen. nov.

Type species: *Gullanema fragilis*

Diagnostic definition

With characters of Cobbiinae. Cephalic region surrounding conical buccal cavity cylindrical, set off from wider cervical region. Strong mouth ring supporting six labial setae and six thin flexible lips. Very long annulated double and triple sets of cervical setae and numerous long single and double somatic setae extending as far as the anus.

Etymology

Named after Dr Penelope Gullen in the School of Life Sciences, Australian National University.

Gullanema fragilis sp. nov.
(FIGS 1-12)

Holotype: Male, SAMA V4259, Kioloa beach, NSW, 27.xi.1986.

Paratypes: 4 males, AHC 24808 and 24813, Kioloa beach, NSW, 27.xi.1986, 15.xi.1987 respectively; AHC 24809 and 24812, Broulee beach, NSW, 3.viii.1980. 8 females, AHC 24810 and 24813-15, Kioloa beach, NSW, 27.i.1986, 3.viii.1980, 26.vii.1978 and 15.xi.1987 respectively; AHC 24812, Broulee beach, NSW, 3.viii.1980; AHC 24816, Moruya beach, NSW, 7.xii.1988; AHC 24817, Seaspray beach, Vic. 3.xii.1988.

Measurements: Table 1

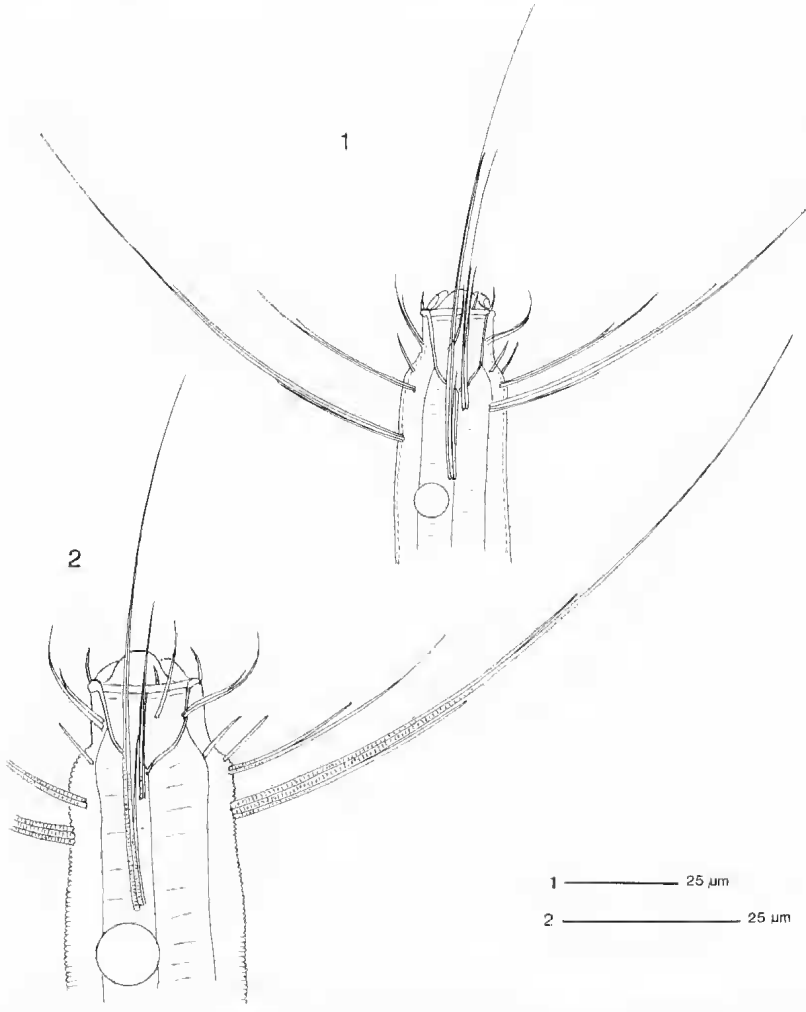
Description of Holotype male.

Body cylindrical, cuticle finely annulated, tail a long narrow tapering cylinder. Head widens sharply at base of narrow peri-buccal 'turret-like' region enclosing buccal cavity. Almost cylindrical buccal cavity, tapered at base, six longitudinal bars reinforce buccal cavity, strong circum-oral mouth ring, surmounted by six flexible very thin lips, about 6 μm high, and six 4μm long inner labial setae. Six 18 μm outer labial, four 12 μm cephalic setae, in one ring, insert near base of peri-buccal 'turret'. Complex hexaradiate array of cervical setae insert between base of buccal region and amphids: most anterior, six 11 μm short setae; next, six longer unequal pairs of cervical setae, 36 and 19 μm; then six longer triplets of unequal length, 166, 102 and 50 μm. The successive sets of cervical setae not inserted in rings around the body at the same level, but each set slightly staggered relative to the long axis of body. Labial, cephalic and cervical setae segmented. Amphids, almost circular, 9 μm diameter, 31 μm behind mouth. Long unequal pairs and single setae insert irregularly between amphids and anus, longest, 209 μm, in pharyngeal region. Also a few short setae along body continue posterior to anus. Two caudal setae, 168 and 145 μm long, at tip of 230 μm long tail. Pharynx cylindrical, cardia conical, rectum short. Two

TABLE 1. *Measurements of* Gullanema fragilis *gen. nov., sp. nov.*

Type	Holo Male	Male Paratypes n = 4 Range	Mean ± SD		Female Paratypes n = 8 Range	Mean ± SD	
Length	1443	1368 - 1482	1444	258	1251 - 2025	1580	261
Width	36	24 - 36	29	4.85	35 - 62	47	8.82
Lips	5	3 - 8	5.5	2.10	5 - 9	6.9	0.58
Inner labial setae	4	8 - 10	9	1.16	7 - 9	8	0.93
Outer labial setae	18	22 - 26	24	2.07	22 - 29	25	2.06
Cephalic setae	12	13 - 19	16	2.50	15 - 20	17	0.53
Amphid diameter	9	7 - 8	7.8	0.50	7 - 9	7.8	0.70
Mouth to amphid	31	27 - 35	30	3.78	22 - 45	32	7.28
Buccal cavity	11	9 - 18	13	3.78	10 - 23	15	4.30
Nerve ring	81	68 - 90	77	9.27	82 - 130	100	17
Pharynx	310	262 - 330	290	30	275 - 365	328	28
Mouth to vulva	-	- -	-	-	751 - 1279	981	160
Mouth to anus	1213	1015 - 1293	1200	126	1019 - 1645	1332	213
Tail	230	171 - 225	199	24	30** - 380	279*	* -
Anal Width	23	21 - 33	26	5.25	21 - 48	34	7.91
Spicule	48	37 - 46	42	4.43	- -	-	-
De Man's a	40.1	41 - 55	51	6.74	26 - 43	34	7.36
" b	4.7	4.4 - 5.4	5	0.43	3.9 - 5.5	4.8	0.50
" c	6.3	6.5 - 9	7.3	0.70	41.7** - 8.6	6*	-
" c'	10.0	6.8 - 9.1	7.83	1.01	1.1** - 11	8.2*	* -
" V%	-	- -	-	-	74 - 81	76	2.58

* Excluding female with truncated tail (n = 7) **Truncated tailed female



Figs 1 and 2. Head of male *Gullanema fragilis* sp. nov. Setae, which are annulated, are illustrated only on one side of the body.

Figs 3 and 4. *Gullanema fragilis* sp. nov. 3. entire male. 4. spicules.

outstretched testes, anterior to left of gut, posterior to right, gonoduct filled with spermatozoa, spicules weak, hardly cephalated, uniformly curved, blunt bifid tips, 48 μm long.

Paratypes: The numbers and location of somatic setae are rather variable, especially the number of caudal setae, which vary from one to three of unequal length, possibly due to breakage during preparation. The number and location of short cervical setae are variable, 9-14 μm long. Two sets of longer cervical setae are consistently present, the first set of six doublets of unequal length, the second of six triplets also of unequal length, but with the points of insertion of each group staggered with respect to the longitudinal body axis. As an example of setal length in one female paratype:- doublet 58, 42, triplet 99, 62, 45, cervical 200, 55 μm. The post-amphidial setae apparently not inserted in regular rows or circles, the most anterior the longest, decreasing to short scattered setae behind the anus. The distance the amphid lies behind the mouth is rather variable both in absolute terms and relative to pharyngeal length. Female paratypes differ significantly from males only in reproductive organs. Females are monodelphic and prodelphic.

Most specimens of both sexes have long tails, but occasional specimens with much shorter tails have been found; an extreme case is illustrated in Fig. 5 (on slide AHC 24810, which also contains a second female with a slightly longer tail). Because the degree of truncation is variable and found on infrequent individuals amongst numerous long-tailed individuals, the short-tailed form is not considered a separate taxon but an infrequent aberration. Because of the variation in tail length, the position of the vulva is more usefully related to the percentage distance from head to anus rather than the more usual head to tip of tail.

Differential diagnosis

The new genus resembles *Steineria* Micoletzky, 1922, and less closely *Trichotheristus* Wieser, 1956, in possessing many very long setae. In *Steineria*, as in *Gullanema*, but unlike *Trichotheristus*, groups of long cervical setae are inserted between the mouth and the amphid. *Gullanema* is quite unlike either genus in the form of the head and shape of the buccal cavity. In these two genera the head tapers gradually to the base of the large lips, whereas in *Gullanema* gen. nov. the head narrows sharply to a cylindrical 'turret-like' region surrounding the buccal cavity. The outer labial and cephalic setae are inserted near the base of the turret, the inner labials at the mouth ring. The lips are smaller, supported by a very strong mouth rim. At the specific level, the weakly cephalated spicules with blunt bifid tips are an important character.

Habitat

Sandy ocean beaches.

Distribution

New South Wales, Victoria.

Subfamily Rhynchonematinae de Coninck, 1965.

After Lorenzen, 1975: head and mouth region very attenuated, buccal cavity long and tubular, cuticle strongly annulated, first cephalic annule wider, amphids circular, tail conical. Uncertainty regarding cephalic sensilla because of difficulty in resolving tiny head with light microscope, inner labial sensilla undescribed, single ring of 6 or 10 cephalic setae. Less than 900 μm long.

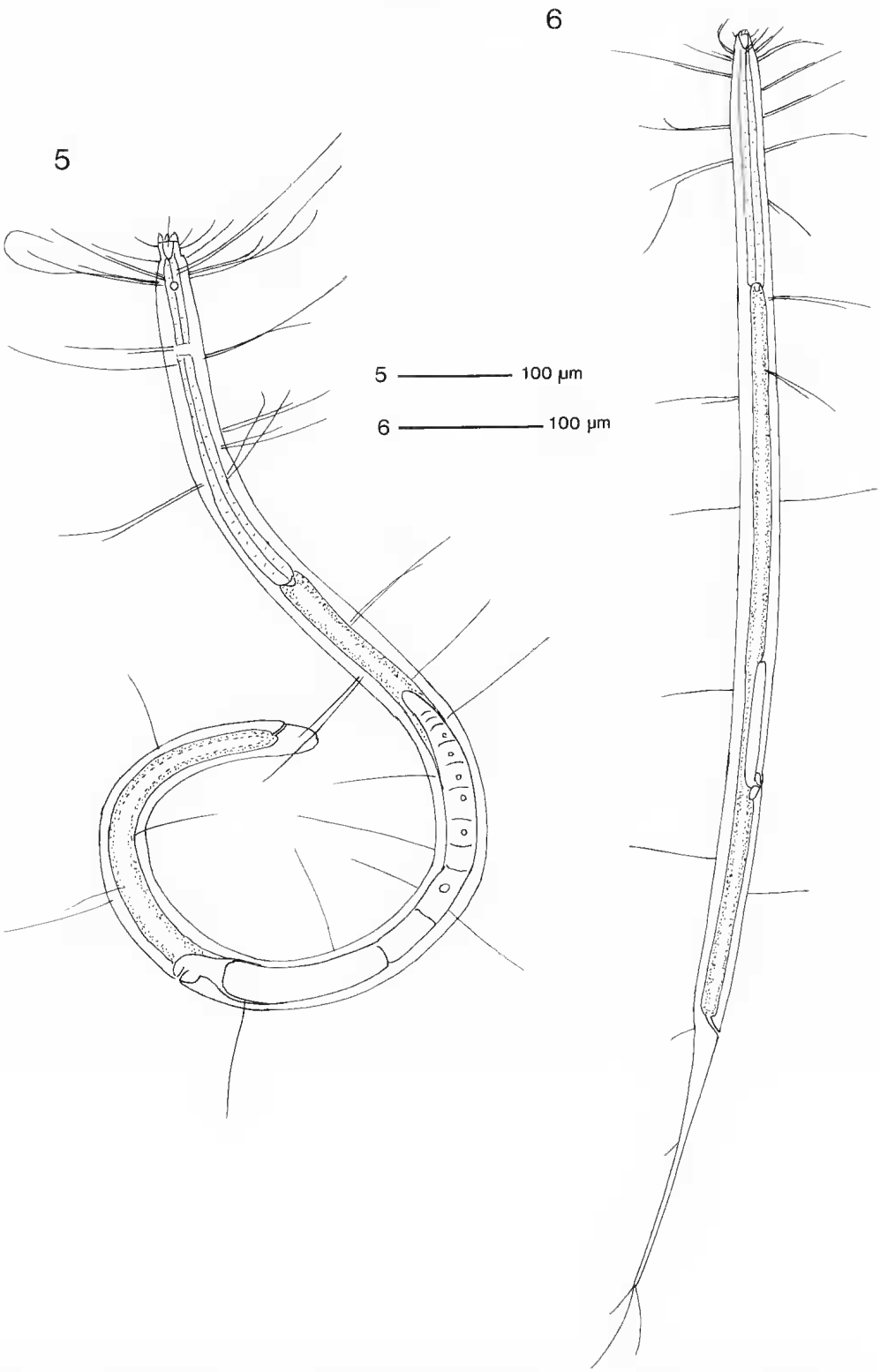
Genus *Rhynchonema* Cobb, 1920

Buccal cavity in two parts; short anterior chamber, at level of cephalic setae, narrow tubular part at least 25 μm long., Amphids placed over or very close to end of buccal tube. Male with two testes.

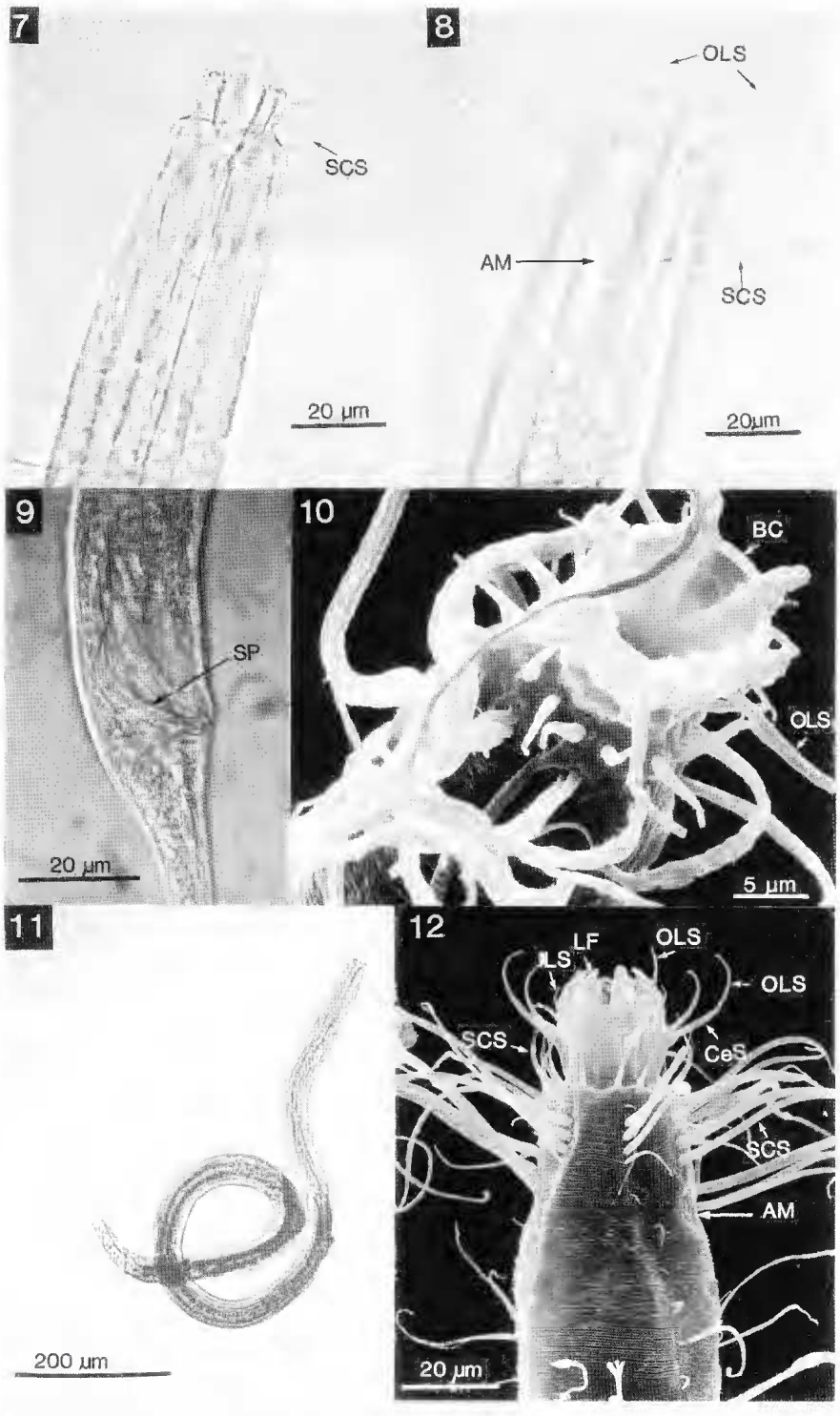
Rhynchonema collare sp. nov.
(FIGS 13-18, 25-30)

Holotype: Male, SAMA V4260, Rosedale beach, NSW, 5.ii.1986.

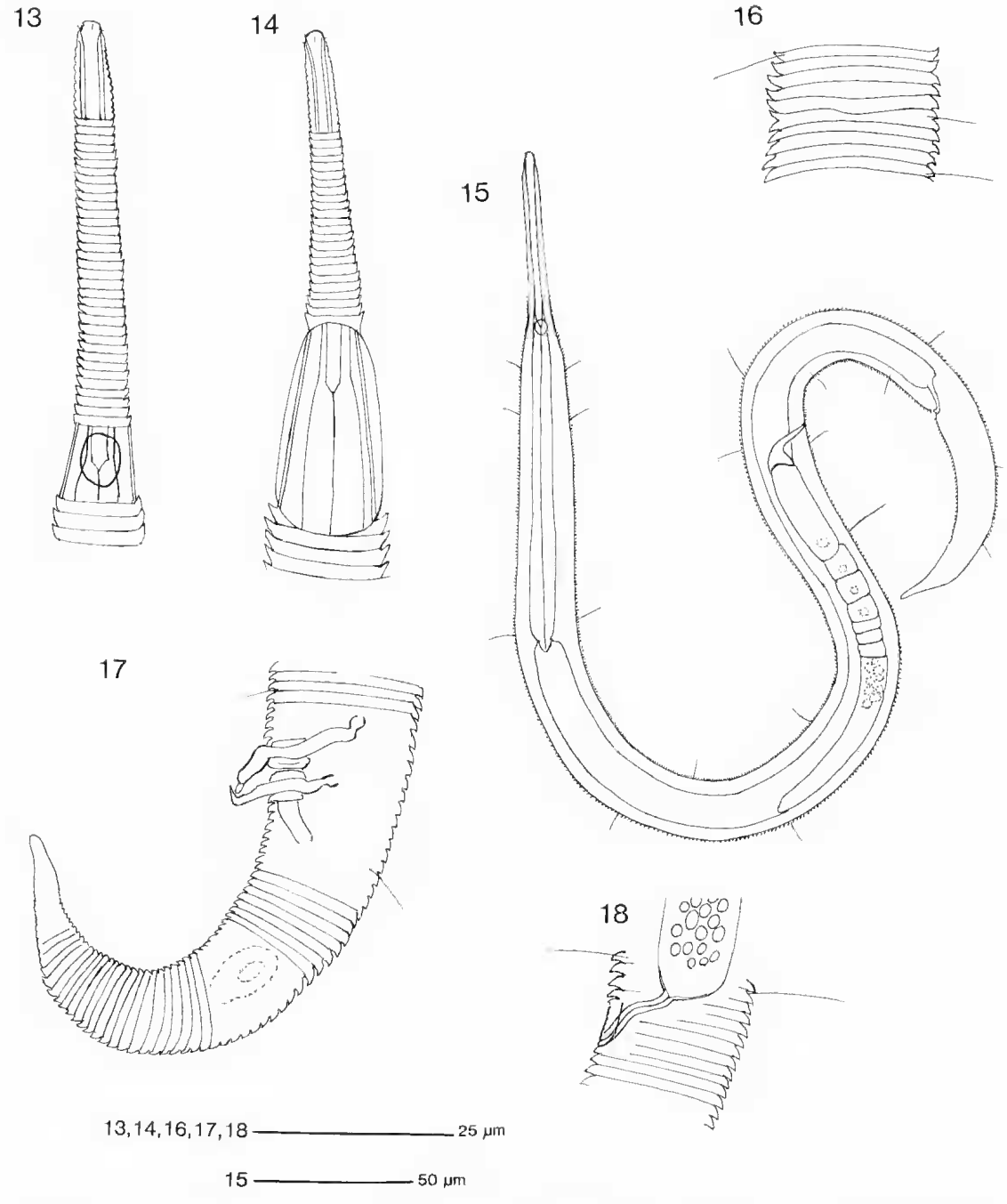
Paratypes: 2 males, AHC 24818, Rosedale beach, NSW, 5.iii.1986 and AHC 24819a Broulee, NSW, 3.viii.1980; 7 females, AHC 24819b-c, Broulee beach, NSW, 3.viii.1986.



Figs 5 and 6. *Gullanema fragilis* sp. nov. 5. female, infrequent short tail form. 6. common long tailed female.



Figs 7-12. *Gullanema fragilis* sp. nov. 7. head to show buccal region. 8. showing amphid. 9. spicules. 10. SEM of buccal cavity. 11. entire nematode. 12. SEM cephalic and sub-cephalic setae. SCS sub-cephalic setae, OLS outer labial setae, AM amphid, SP, spicule, BC, buccal rim, LF, lip flaps, ILS inner labial setae, CeS, cephalic setae.



Figs 13-18. *Rhynchonema collare* sp. nov. 13. female head. 14. male head. 15. entire female. 16. inversion of annules. 17. male tail and spicules. 18. female vulva and operculum.

TABLE 2. *Measurements of* Rhynchonema collare *sp. nov.*

Type	Holo	Male Paratypes		Female Paratypes n = 8		
	Male	Male	Male	Range	Mean ± SD	
Length	476	412	579	511 - 552	533	19
Width	20	19	17	20 - 23	21.8	1.10
Body setae	-	13	-	17 - 17	17	0.00
Buccal cavity	53	38	52	47 - 54	51	2.65
Amphid, length	21	18	19	6 - 9.5	8	1.32
Amphid, width	10	10	12	6 - 7	6.7	0.45
Mouth to amphid	52	30	42	44 - 55	49	4.06
Mouth to nerve ring	-	-	88	84 - 93	90	3.87
Pharynx	125	104	162	124 - 152	138	13
Mouth to vulva	-	-	-	316 - 391	365	35
Mouth to inversion%	56	55	58	56 - 73	60	5.67
Mouth to anus	399	328	515	439 - 483	468	19
Anal width	17	18	16	15 - 17	15.6	0.89
Tail	77	65	75	54 - 74	65	8.72
Spicule, long	16.8	18.7	16.2	- -	-	-
Spicule, short	13.7	13.2	12.8	- -	-	-
De Man's a	24	22	34	22 - 26	24	1.52
" b	3.8	4.0	3.6	3.6 - 4.1	3.8	0.27
" c	6.2	6.3	7.7	7.1 - 9.9	8.3	1.12
" c'	4.5	3.6	4.7	3.0 - 4.9	4.2	0.43
" V%	-	-	-	61 - 73	69	5.41

Measurements: Table 2.

Description of Holotype male

Very small, with long attenuated cervical region, plump post-cervical region, rather long broad curved conical tail, recurved at tip. Cuticle strongly annulated, annule profiles sharply angled forward on front half of body, backward on posterior, abruptly changed (inverted) at 56% body length; very thin somatic setae spaced uniformly between amphid and anus. Buccal cavity a shallow cup leading into long narrow parallel-sided tube with strongly cuticularised walls extending length of narrow cervical region to level of middle of amphid. Six cephalic setae at base of buccal cup, extremely large elongated amphids enclosing posterior 40% of narrow cervical region; no annulation between amphids. Pharynx cylindrical, cardia heart-shaped. Spicules unequal, weakly cephalated, lacking rectangular bend, tips turned up. Large gubernaculum encloses mid region of spicules, strong dorso-caudal apophysis.

Paratypes: Amphids strongly dimorphic, in females relatively large, but much smaller than in males, separated by strong non-annulated cuticle. Vulva with operculum, on which annulation greatly reduced or absent. Terminal vaginal canal cuticular. Lorenzen's formula:- b,a,o*,g,+,2,o,w; *new letter because spicules do not correspond to any of those figured by Lorenzen (1975).

Differential diagnosis

The new species can be distinguished from some other species by possessing sharply angled annulation along the whole body and by the possession of sexually dimorphic amphids. It lacks the pre-anal supplements and strong somatic setae and equal spicules found in *R. hirsutum* Hopper, 1961. It more closely resembles *R. chiloense* Lorenzen, 1975, and *R. scutatum* Lorenzen, 1971 but has quite differently shaped spicules. The male amphids are larger than either of these species. It differs from *R. tomakinense* sp. nov. in the larger male amphid, absence of annulation between amphids, and in possessing a cuticular vaginal canal.

Habitat

Sandy ocean beaches.

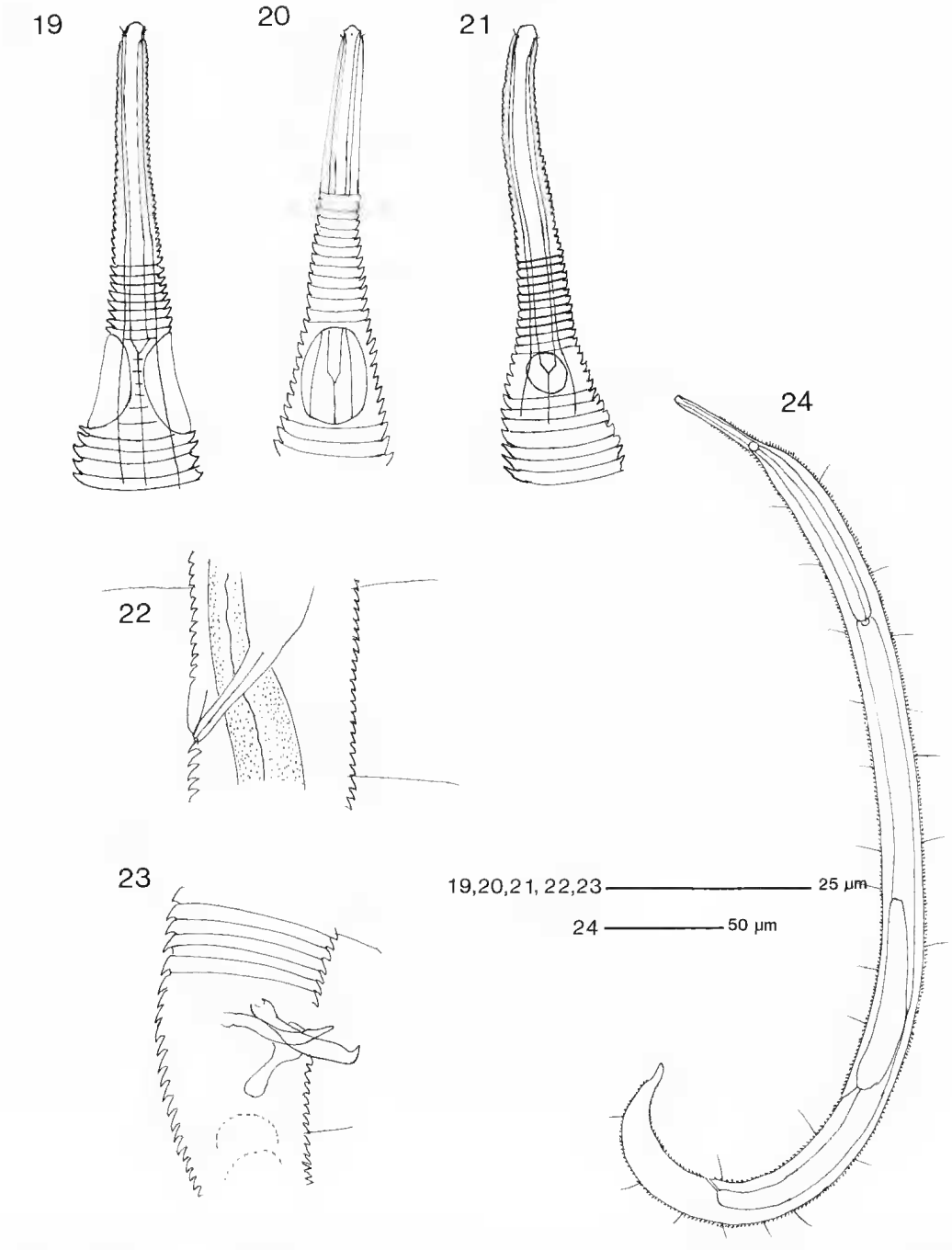
Distribution

New South Wales.

Rhynchonema tomakinense sp. nov. (FIGS 19-24)

Holotype: Male, SAMA V4261, Tomakin beach, NSW, 11.xi.1986.

Paratypes: 3 males and 5 females, additional male and 3 females on holotype slide; male and female, AHC 24820a, Rosedale beach, NSW, 22.xi.1986 and female, AHC 24820b, Rosedale beach, 5.ii.86; male, AHC 24821, Rapid Creek beach, NT, 31.vii.1986.



Figs 19-24. *Rhynchonema tomakinense* sp. nov. 19. male head, dorsal view. 20. male head, lateral view. 21. female head. 22. vulva and operculum. 23. spicules. 24. entire female.

TABLE 3. *Measurements of* Rhynchonema tomakinense *sp. nov.*

Type	Holo	Male Paratypes n = 3		Female Paratypes n = 5	
	Male	Range	Mean ± SD	Range	Mean ± SD
Length	551	438 - 495	485 30	489 - 592	545 38
Width	22	19 25	20 3.12	22 - 24	23 1.51
Body setae	11	9 - 18	12.6 -	13 16	14.6 -
Buccal cavity	44	48 57	49 4.73	44 - 49	47 1.52
Amphid, length	14	9 - 12	12 1.73	6 - 9	7.2 1.10
Amphid, width	10	8 - 12	8 2.31	6 8	6.4 0.89
Mouth to amphid	38	40 - 43	43 1.58	38 - 44	42 2.68
Pharynx	121	105 - 110	110 108	120 - 149	134 11
Mouth to vulva	-	- -	- -	345 - 430	386 36
Mouth to inversion%	54	52 66	57 7.57	51 - 58	55 2.86
Mouth to anus	474	382 - 439	413 29	423 - 524	476 38
Anal width	18	17 - 18	17 0.58	15 - 18	16 1.52
Tail	77	56 68	60 6.93	64 - 73	68 3.65
Spicule	18	11 19	14.6 4.04	- -	- -
Gubernaculum	11	- -	- -	- -	- -
De Man's a	25	22 - 24	23 1.00	20 26	24 2.45
" b	4.6	4.1 4.7	4.4 0.30	3.5 - 4.5	4.1 0.43
" c	7.2	7.1 - 8.8	7.9 0.85	7.4 8.7	8.0 0.63
" c'	4.3	3.1 - 4.0	3.4 0.52	4.2 - 3.7	4.2 0.40
" V%	-	- -		66 - 73	71 2.83

Measurements: Table 3.

Description of Holotype male

Very small, cervical region long and attenuated, post-cervical region plump, tail curved, conical, rather long and broad with recurved tip. Strongly annulated, sharp border angled forward, especially in amphidial region, direction sharply inverted 54% from anterior end. Six very small cephalic setae inserted at base of buccal cup, from which narrow, parallel-sided cuticular buccal tube extends length of cervical region. Large circular amphids located over end of buccal tube, annulation continues between amphids. Cylindrical pharynx, heart-shaped cardia. Thin setae spaced along body from cervical region to anus. Spicules cephalated, asymmetric, slightly unequal size, without strong rectangular curvature, tips turned up. Gubernaculum encloses middle of spicules, strong dorso-caudal apophysis.

Paratypes: Amphids dimorphic, smaller in female, vulva with operculum, vaginal canal not cuticularised. Lorenzen's formula:- b,a,p*,r, + ,2,o,u. *new letter because spicules do not correspond to any of those figured by Lorenzen (1975).

Differential diagnosis

This species is very close to *R. collare* sp. nov. The two are sibling species from the same beaches but can be clearly distinguished by several features. Annulation continues between the amphids in both sexes, whereas there is smooth cuticle in *R. collare* sp. nov. The male amphids are not as large. The vaginal canal is not cuticular and the spicules show greater asymmetry. *R. tomakinense* resembles *R. chiloense* Lorenzen, 1975, and *R. scutatum* Lorenzen, 1971, but has quite differently-shaped spicules.

Habitat

Sandy ocean beaches.

Distribution

New South Wales, Northern Territory.

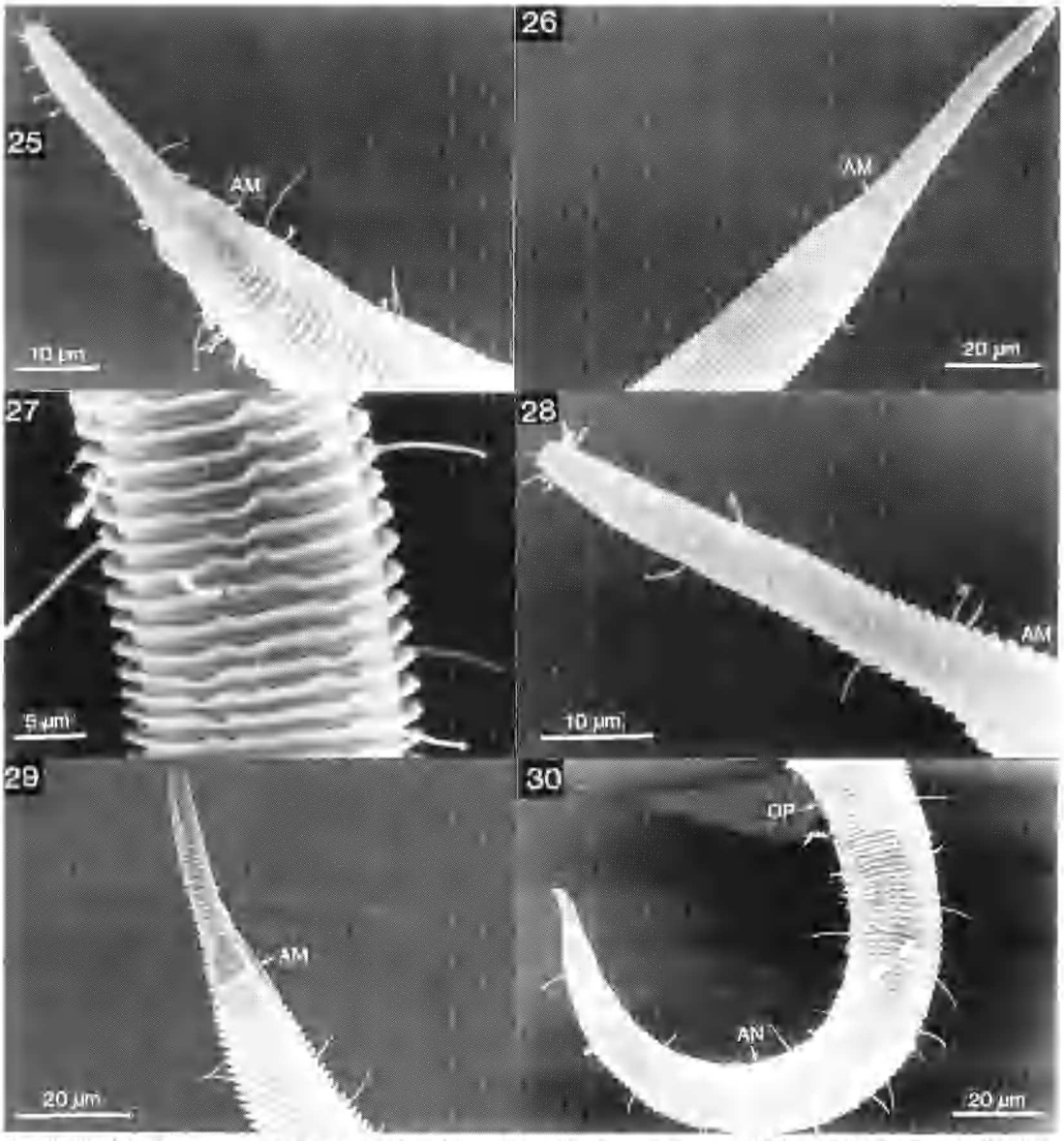
Rhynchonema chiloense Lorenzen, 1975

Material examined

One male and one female and juvenile, off-shore, Cronulla, NSW, one female, Rapid Creek beach, NT.

Description

Lorenzen's formula:- b,s,i,r, + ,2,o,u. De Man's ratios:- a = 18-23, b = 3.2-3.6, c = 8-10, V = 73%; inversion of annulation 52%. Spicule are length 26, more than twice length given in Lorenzen's paper, but that seems by comparison with the drawing to be chord length, and by comparing drawings our male's spicules are only slightly longer in a larger male. The cuticle and body setae are stronger than in the other species of *Rhynchonema* we have found



Figs 25-30. *Rhynchonema collare* sp. nov. by SEM. 25. male head, and cervical region. 26. female head and cervical region. 27. annulation pharyngeal region; *Rhynchonema tomakinense* sp. nov. 28. female head and cervical region. 29. male cervical region. 30. female posterior. AM amphid. OP operculum. AN anus.

Habitat

Sandy ocean beach and shallow sub-littoral sand.

Distribution

New South Wales and Northern Territory.

Rhynchonema gerlachi Vitiello, 1967

Material examined

Three males and one female, off-shore Cronulla, NSW.

Description

Lorenzen's formula:- i,s,g,r,=,2,u. Agrees with Vitiello's (1967) description except that he did not illustrate the vulva. Our specimens possess an operculum but no strongly cuticular terminal duct corresponding to u in Lorenzen's formula. According to Vitiello the spicules have bifid tips, but his figure shows sharply pointed tips with one spicule rotated on its long axis. The spicules in our specimens are just like his illustration. According to Vitiello there are three pre-anal papillae in males but these are not shown in his illustration. We observe one to three minute pre-anal bumps, but cannot determine whether they contain papillae because of the strong annulation. Our specimens are smaller than Vitiello's adult specimens, L = 390-632 compared with 742-793 but De Man' ratios in our specimens:- a = 20-26, b = 3.5-4.8, c = 6.3-10.2, c' = 2.8-3.9, V = 75% are in agreement with Vitiello's.

Habitat

Shallow sub-littoral and intertidal beach sand.

Distribution

New South Wales

Prorhynchonema Gourbault, 1982

Buccal cavity in two parts; anterior short, at level of cephalic setae, posterior tubular, not more than 15 μm. Amphids circular, placed well posterior to end of buccal tube.

Prorhynchonema gourbaultae sp. nov.
(FIGS 31-35)

Holotype: Male, SAMA V4262, Kioloa beach, NSW, 31.vii.1986.

Paratypes: 3 males and 3 females, AHC 24822, Kioloa beach, NSW, 31.ii.1976.

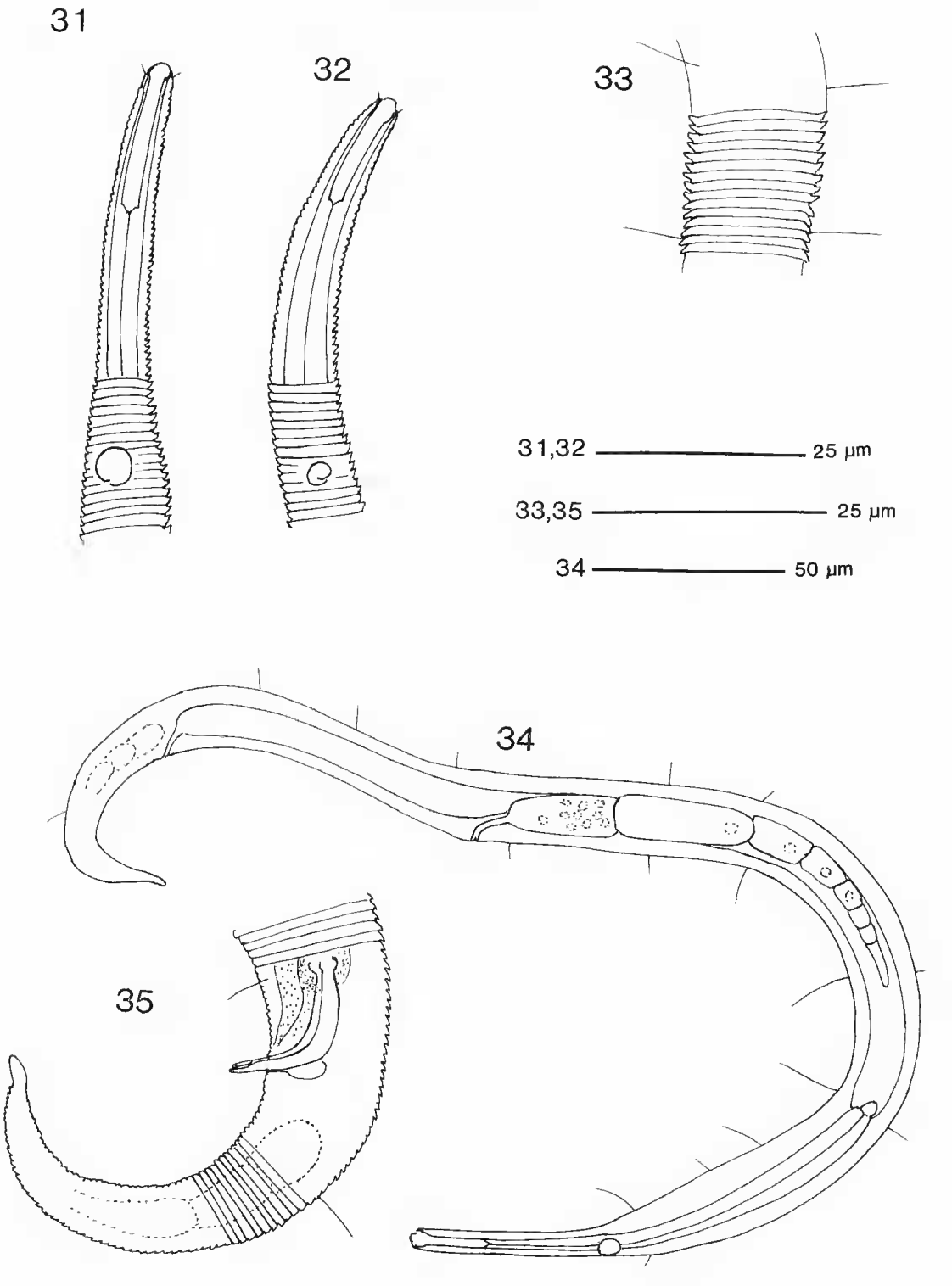
Measurements: Table 4.

Description of Holotype male

Body cylindrical, anterior attenuated from level of amphids to small head, about 10% of body length; tail conical, curved ventrally, tip slightly reflexed. Cuticle weakly annulated, annules about 1 μm wide, first annule wider, inversion of annule direction 50%; sparse thin somatic setae, 11 μm long. Inner labial setae not visible, six short cephalic setae in one ring, less than 1 μm long, amphids circular, cryptospiral, 30% body width, situated much farther posterior, 9.5% of length, about 55 annules from mouth, well beyond end of buccal tube. Buccal cavity long narrow parallel-sided tube, 3.8% of body length, slightly expanded at level of cephalic setae; pharynx cylindrical, widens gradually as body widens behind level of amphid, cardia rounded. Spicules cephalated, smoothly curved, slightly attenuated narrow spoon-shaped rounded tip, gubernaculum simple plate with small caudo-dorsal apophysis, three post-anal caudal glands.

TABLE 4. *Measurements of* Prorhynchonema gourbaultae *sp. nov.*

Type	Holo Male	Male Paratypes n = 3 Range	Mean	Female Paratypes n = 3 Range	Mean
Length	452	460 - 491	476	439 - 453	445
Width	15	16 - 18	17	19 - 20	19
Buccal cavity	17	15 - 16	16	15 - 16	15
Amphid	2.6	2.5 - 3	2.8	3 - 3.5	3.3
Mouth to amphid	43	40 - 47	43	39 - 42	41
Pharynx	144	102 - 122	117	128 - 138	132
Mouth to vulva	-	- -	-	308 - 322	314
Mouth to anus	384	390 - 420	408	380 - 396	387
Anal breadth	14	14 - 14	14	14 - 14	14
Tail	66	62 - 71	68	53 - 62	57
Spicule	22	23 - 25	24.5	- -	-
De Man's a	30	27 - 31	29	22 - 24	23
" b	3.1	3.8 - 4.4	4.1	3.2 - 3.5	3.4
" c	6.8	6.6 - 7.7	7.1	7.1 - 8.3	7.8
" c'	4.7	4.4 - 5.1	4.8	3.8 - 4.4	4.1
" V%	-	-	-	70 - 71	71



Figs 31-35. *Prorhynchonema gourbaultae* sp. nov. 31. male head. 32. female head. 33. inversion of annules. 34. entire female. 35. male tail and spicules.

Paratypes: Female paratypes resemble male holotype, apart from reproductive organs, but amphids slightly larger, 2.7-3.5 μm cf 2.6-3 μm. Single anterior ovary, vulva simple not cuticularised, no operculum.

Habitat

Intertidal sandy beaches.

Distribution

New South Wales.

Differential diagnosis

The new species differs from the other described species, *P. warwicki* Gourbault, 1982, by having very different spicules and a longer cervical region and buccal tube. The relative length of the buccal tube is similar to *R. brevituba* Gerlach, 1953 but the spicules are different and in *R. gerlachi* annulation does not show inversion.

Prorhynchonema warwicki Gourbault, 1982.

Material examined

Three males and 3 females from Rosedale and Tomakin beaches, New South Wales.

New subfamily Corononeminae

With characters of family. Buccal cavity cylindrical, deep and wide, not enclosed by pharyngeal musculature; amphid situated above base of buccal cavity. Cervical region only slightly attenuated. Six inner labial setae in one ring, six outer labial and four cephalic setae in second ring. Strong cuticular annulation begins at base of buccal region.

Genus ***Corononema*** gen. nov.

Type species: *Corononema parvum*

Diagnostic definition

Cuticle strongly annulated with eight longitudinal ridges. Lips high, incised. Deep groove around the head just posterior to the insertion of six inner labial setae, in front of outer labial and cephalic setae, sets off the lip region from the slightly tapered buccal region.

Etymology

Corona, Latin for crown, because the head appears to be crowned by the incised lips, set off from the cylindrical buccal region by a deep groove.

Corononema parvum sp. nov.
(FIGS 36-40, 50-53)

Holotype. Male, SAMA V4263, Rapid Creek beach, NT, 31.vii.1986.
Paratypes. 6 males, 5 AHC 24823a-c, Rapid Creek beach, NT, 31.vii.1986; 1 male, AHC 25824, Southport beach, Qld; 7 females, 6, AHC 24823, Rapid Creek beach, NT, 31.vii.1986; 1, AHC 24824, Southport beach, Qld, 31.vii.1986.

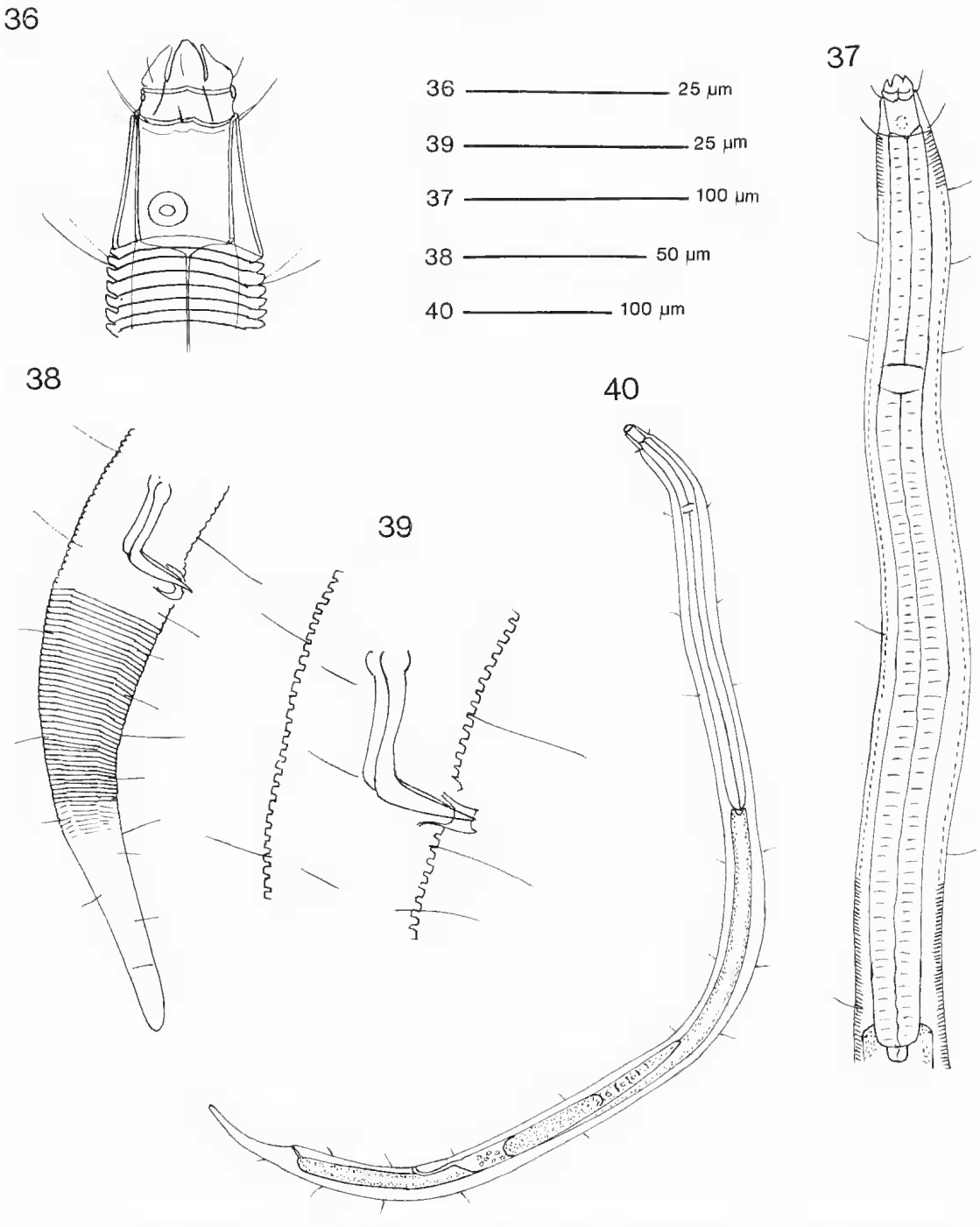
Measurements: Table 5

Description of Holotype male.

Cuticle strongly annulated, annules 1.8 μm, with eight equidistant longitudinal ridges, weakly developed in cervical region, pronounced mid-body, which is polygonal in cross section, extending almost to blunt

TABLE 5. *Measurements of* Corononema parvum *sp. nov.*

Type	Holo	Male Paratypes n = 6			Female Paratypes n = 6		
	Male	Range	Mean	± SD	Range	Mean	± SD
Length	855	800 - 1045	911	111	840 - 1084	977	71
Width	27	22 - 26	24	1.36	22 - 38	28	4.63
Annulation	1.6	1.5 - 2	1.8	0.19	1.7 - 2	1.9	0.12
Lip height	5.5	4.5 - 6	5.4	0.59	4 - 5.5	5	0.50
Outer labial setae	5	4 - 6	4.6	0.89	6 - 9	6.9	1.01
Sub-cephalic setae	12	11 - 19	15.4	2.97	10 - 12	11	1.00
Body setae	11	13 - 19	16.2	2.39	9.5 - 21	13.5	3.99
Amphid	5	4 - 4.8	4.6	0.40	4.4 - 6	5.3	0.82
Buccal cavity, length	13	11 - 16	13.3	1.97	13 - 18	15.7	1.80
Buccal cavity, width	9	8 - 10	9	0.63	8 - 11	9.9	0.95
Mouth to nerve ring	97	90 - 120	100	11	100 - 132	107	13
Pharynx	322	285 - 360	314	30	310 - 380	352	26
Mouth to vulva	-	- -	-	-	687 - 870	799	63
Mouth to anus	781	714 - 973	843	107	762 - 975	900	74
Width at anus	21	19 - 23	21	1.33	20 - 23	22	1.27
Tail	74	72 - 87	79	5.92	68 - 105	80	12
Spicule, arc	27	25 - 31	27.8	2.56	- -	-	-
De Man's a	32	32 - 44	37	5.01	26.0 - 40.0	35.0	4.91
" b	2.7	2.6 - 3.6	2.9	0.36	2.4 - 3.1	2.8	0.27
" c	11.6	9.3 - 14.5	11.6	2.01	9.8 - 15.2	12.4	1.91
" c'	3.5	3.3 - 4.5	3.8	0.47	3.20 - 5.30	3.80	0.71
" V%	-	- -	-	-	80 - 84	81	1.38



Figs 36-40. *Corononema parvum* sp. nov. 36. male head. 37. head and pharyngeal region. 38. male tail. 39. spicules. 40. entire female.

cylindrical tip of tail. Cervical region enclosing buccal cavity not annulated or ridged, slightly attenuated towards mouth. Deep groove, with less strong cuticle, surrounds buccal region just below the lips, two scalloped cuticular rings lie just within mouth. Six incised leaf-like lips, six inner labial setae at base of lips, six outer labial and four cephalic setae insert posterior to the groove; four strong cervical setae, 12 μm insert at base of non-annulated buccal region on first annule, numerous body setae, amphid fovea situated over base of buccal cavity, 5 μm diameter, 25% head width. Wide, deep buccal cavity with strong almost parallel-sided walls. Cylindrical pharynx. Two outstretched, inactive testes; spicules cephalated, rectangular curvature, simple pointed tips; gubernaculum surrounds spicule tips.

Paratypes: The spicules differ somewhat in the degree of curvature and may appear different because of partial rotation about their axes and the pointed tips may be turned outwards. Females, apart from the reproductive organs, closely resemble males. Females possess a single anterior gonad; the vulva has no operculum. The labial and cephalic setae are difficult to measure by light microscopy because of their small size, but from scanning electron microscopy the inner labials are about 1.2 μm long, the outer labials about 0.5 μm and the cephalic about 2 μm long.

Differential diagnosis

The deep parallel-sided buccal cavity, without teeth, with four strong setae at the base is distinctive. The indented weakly cuticular groove below the insertion of the lips is unlike that found in other Xyalidae.

Habitat

Sandy ocean beaches.

Distribution

Tropical and sub-tropical beaches in the Northern Territory and Queensland, Australia.

Coronema thai sp. nov.
(FIGS 41-49, 54-56)

Holotype: Male, SAMA V4264, Pathaya beach, Chonburii, Thailand, 30.ix.1985.
Paratypes: 4 males, AHC 24825, and 7 females, AHC 24826 Pathaya beach, Chonburii, Thailand, 30.ix.1985.

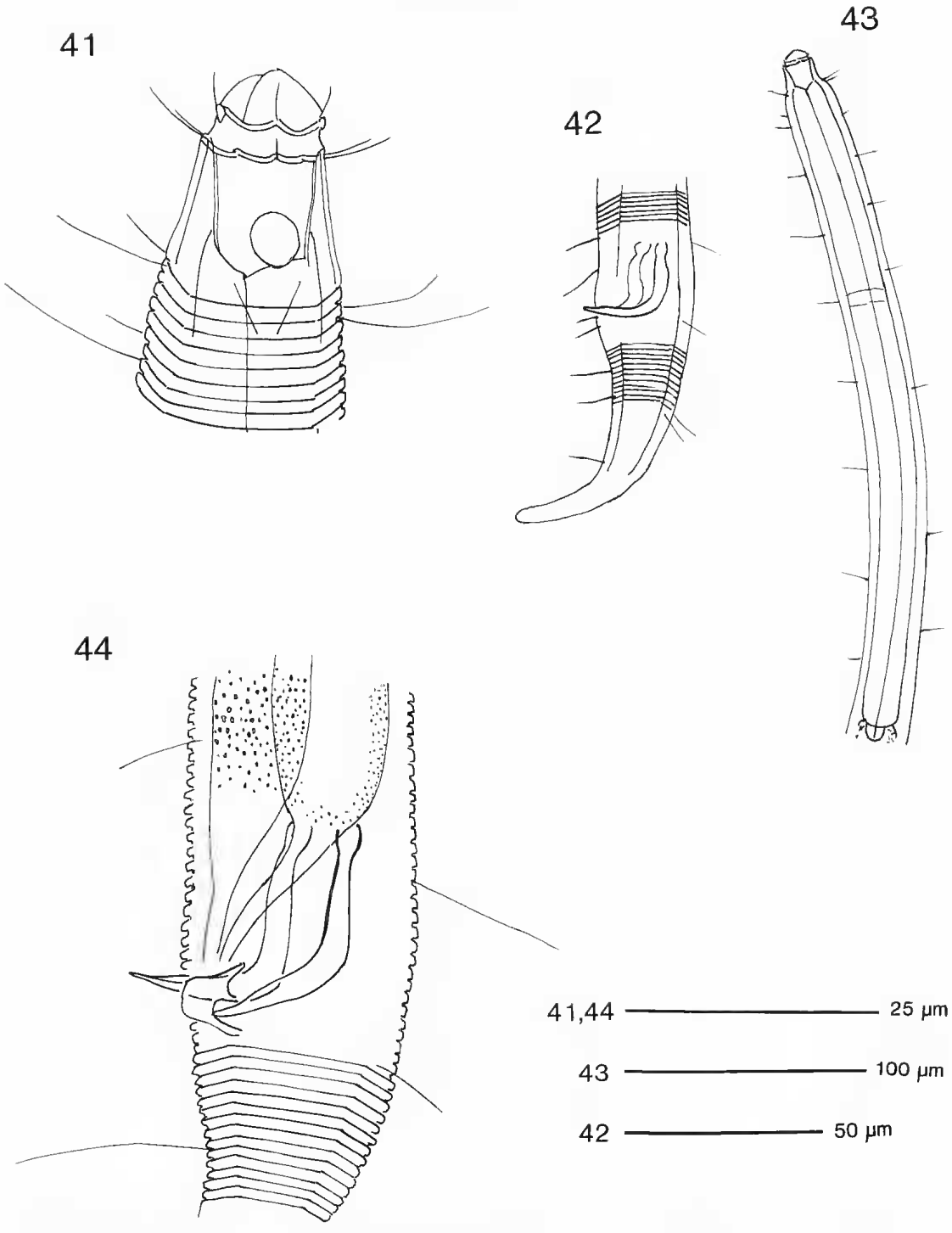
Measurements: Table 6

Description of Holotype male

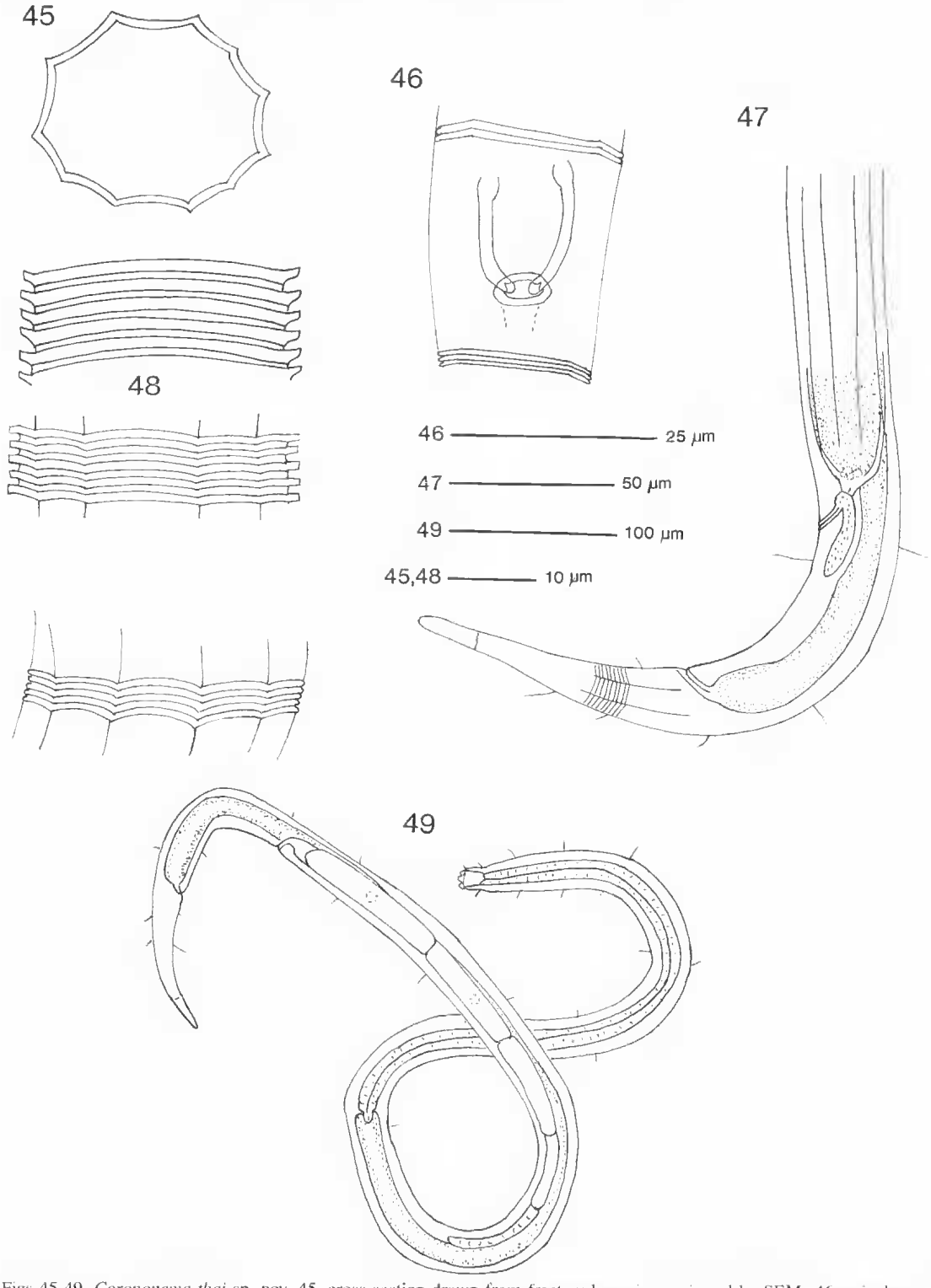
Strongly annulated cuticle, annules 1.6 μm wide, 8 longitudinal ridges from buccal region almost to tip of tail. Buccal region not attenuated, only slightly widening from mouth to base, enclosing deep, wide unarmed buccal cavity. Lips high, leaf-like, fold over wide mouth. Lip region separated from buccal region by deeply indented weakly cuticular circum-oral ring sandwiched between two circum-oral crenellated cuticular rings. Six inner labial setae inserted at base of lips, six outer labial and four cephalic setae inserted below indented ring. Long thin body setae spaced along body, six cervical setae inserted on first annule at base of buccal region. Cylindrical pharynx. Two outstretched testes, anterior to left of gut, posterior to right; spicules cephalated, rectangular curvature, simple pointed tips; gubernaculum surrounds spicule tips.

TABLE 6. *Measurements of* Coronema thai *sp. nov.*

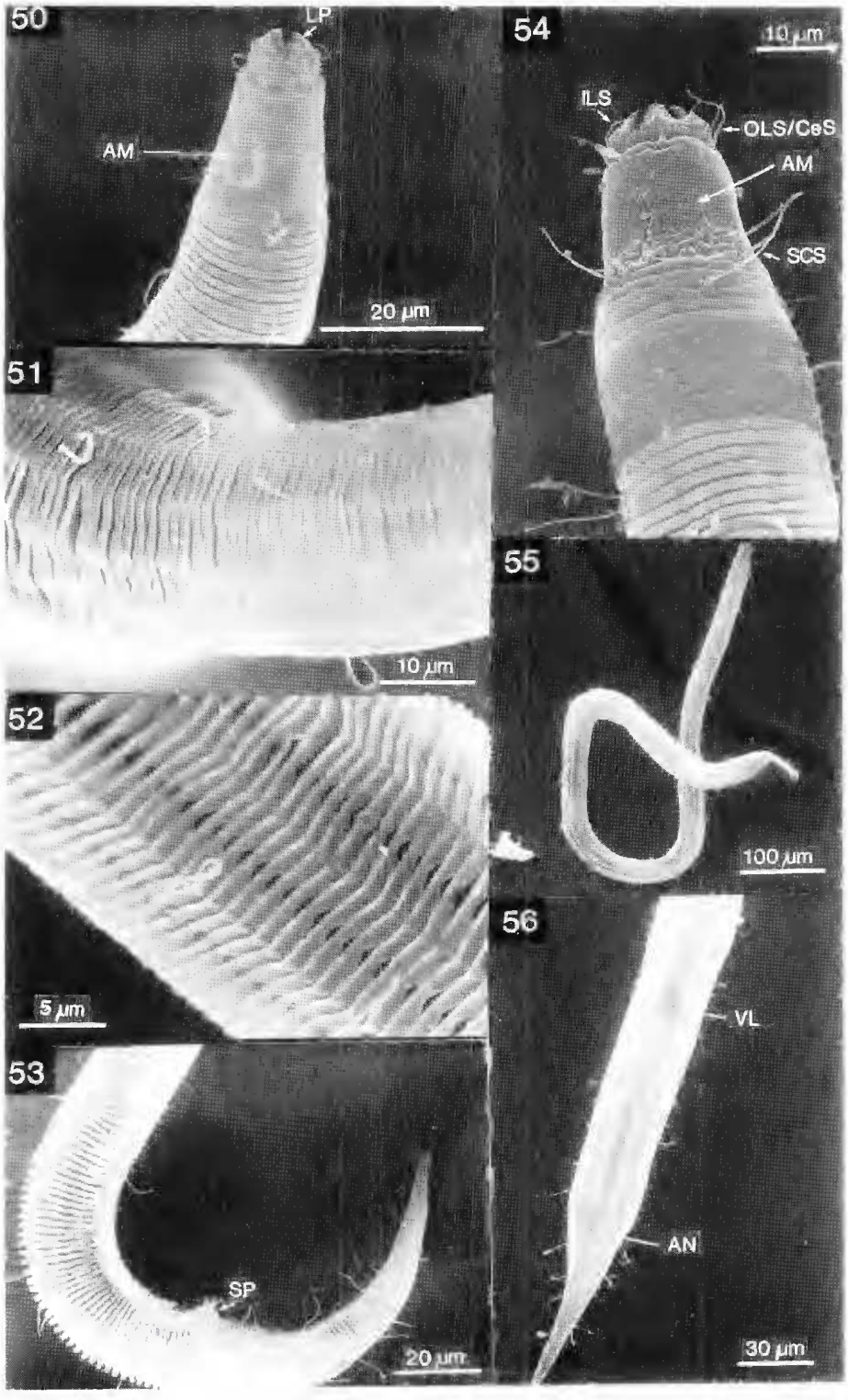
Type	Holo	Male Paratypes n = 4			Female Paratypes n = 6		
	Male	Range	Mean ± SD		Range	Mean ± SD	
Length	990	652 - 958	754	138	790 - 1082	946	106
Width	27	25 - 28	21	1.29	31 - 35	32	1.51
Annulation	1.6	1.6 - 1.7	1.6	0.05	1.4 - 1.8	1.6	0.15
Lip height	4.4	4 - 5	4.8	0.05	6.5 - 7.5	7	0.50
Outer labial setae	6	5 - 8	6.9	1.44	6 - 10	9.3	1.63
Sub-cephalic setae	14	9 - 14	12	2.50	10 - 12	11	1.00
Body setae	13	10 - 16	12.8	2.50	11 - 14	12.4	1.52
Amphid	4.7	4 - 5.5	4.6	0.75	4 - 6	5.4	0.76
Buccal cavity, length	12	9 - 16	12.5	2.89	11 - 13	11.7	0.82
Buccal cavity, width	12	8 - 11	9.8	8.00	10 - 12	11	1.11
Mouth to amphid	7	6 - 15	10	3.74	5 - 7.4	5.8	1.17
Mouth to nerve ring	76	84 - 118	95	16	70 - 92	82	8.51
Pharynx	264	241 - 288	262	21	285 - 424	320	52
Mouth to vulva	-	-	-	-	650 - 871	768	8.50
Mouth to anus	19	589 - 895	691	138	722 - 988	858	100
Width at anus	24	20 - 24	22	1.71	22 - 26	24.2	1.33
Tail	71	61 - 68	64	2.99	68 - 101	86	13
Spicule, arc	32	26 - 32	28	2.63	- -	-	-
De Man's a	37	24.0 - 38.0	28.0	6.56	23.0 - 34.0	29.3	3.93
" b	3.8	2.5 - 3.5	2.9	0.45	2.6 - 3.4	3.0	0.34
" c	13.9	10.3 - 15.2	11.9	2.28	9.0 - 13.3	11.2	1.74
" c'	0.3	2.6 - 3.1	3.0	0.24	3.10 - 4.00	3.60	0.44
" V%	-	-	-	-	80 - 84	81	1.60



Figs 41-44. *Corononema thai* sp. nov. 41. male head. 42. male tail. 43. head and pharyngeal region. 44. spicules.



Figs 45-49. *Coronomema thai* sp. nov. 45. cross section drawn from fractured specimen viewed by SEM. 46. spicules in ventral view. 47. female posterior end. 48. annulation by SEM successively near head, mid-body and near tail. 49. entire female.



Figs 50-56. *Corononema* gen. nov. by SEM. 50-53. *C. parvum* sp. nov. 54-56. *C. thai* sp. nov. AM amphid, LP lips, ILS inner labial setae, OLS/CeS outer labial and cephalic setae, SCS sub-cephalic setae, SP spicules, VL vulva, AN anus.

Paratype. Female paratypes possess a single anterior ovary, vulva without operculum, prominent post-vulval gland, otherwise females closely resemble males.

Differential diagnosis

C. thai sp. nov. differs from *C. parvum* sp. nov. by possessing a shorter broader head. As an index of this difference the ratio of length to breadth of the pre-annulated buccal region has been measured. In *C. parvum* the ratio ranged from 0.87 to 1.04 (n = 30), in *C. thai* from 0.64 to 0.75 (n = 10). The annulation is shallower in *C. thai*. Both these properties are most clearly seen in scanning electron micrographs of the head (Fig. 52).

Habitat

Tropical sandy beaches.

Distribution

Thailand.

Discussion

The taxonomic position and rank of the Corononeminae presents difficulties. The circular cryptospiral amphids and single prodelphic female gonad are characteristic of Xyalidae. The strongly annulated cuticle and buccal cavity lacking teeth are also shared with most Xyalidae, although some possess tooth-like ridges in the buccal cavity. The deep unarmoured buccal cavity with strong cylindrical walls is found in other Xyalidae, such as *Omicronema* and all Rhynchonematinae, but whereas in Rhynchonematinae the buccal cavity terminates as a narrow tube of varying length, the buccal cavity of *Corononcma* is relatively wide and short. The cephalic region is attenuated, but not to the marked degree so characteristic of Rhynchonematinae. For these reasons the new genus, *Corononcma*, is best placed within the Xyalidae, but would stretch the definition of the two previously recognised subfamilies too far so that the erection of a new subfamily seems warranted.

Lorenzen (1978) in his review of the superfamily Monhysteroidea does not recognise any subfamilies within the Xyalidae, noting, in this regard, that essential aspects of the phylogenetic relationships within the Monhysteroidea have not been cleared up. We do not find this sufficient reason to abandon the previously recognised division of the Xyalidae into two clearly separable subfamilies, namely the Cobbiinae and Rhynchonematinae. Whether we are justified in creating another subfamily for two species with intermediate characters must be a matter of personal judgement. In *Corononcma* the form of the cervical region and buccal cavity are intermediate between that found Rhynchonematinae from Cobbiinae, but there is no overlap and clear differences remain between the three taxa. The deeply incised labial region and a flexible indented ring separating the cephalic region from the buccal region are in our view significant distinguishing attributes of the Corononeminae. It may well be when the very poorly known nematode faunae of Australia and South East Asia are better known more species will be found assignable to the subfamily.

The indented circum-oral ring is probably flexible and may facilitate the ingestion of larger particles than would otherwise be possible. A flexible oral region has been observed to facilitate the ingestion of relatively large diatoms by other Xyalidae such as *Daptonema*.

Acknowledgments

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